Yarn, Yarn and More Yarn – December 13, 2021

Problems & Solutions

Every year, during the holiday season, Mary knits gifts for several of her relatives. This year, she plans to make a hat for her cousin, a scarf and hat for her grandmother, two pairs of socks for her grandfather, two hats and a scarf for her mother, and a hat and two pairs of socks for her father. Each hat requires 1 ball of yarn, each scarf requires 3 balls of yarn, and each pair of socks requires 1.5 balls of yarn. What is the minimum number of balls of yarn Mary must have to complete all the knitted gifts she intends to make?

*Mary is making a total of 5 hats, 2 scarves and 4 pairs of socks. The problem tells us that each hat requires 1 ball of yarn, each scarf requires 3 balls of yarn, and each pair of socks requires 1.5 balls of yarn. Thus, Mary needs 5(1) + 2(3) + 4(1.5) = **17** balls of yarn.*

After completing the hats, scarves and socks, Mary decides to make a very special holiday blanket. This blanket requires 1300 yards of yarn. Two hundred of these yards should be one color, 800 yards should be a second color, and the remaining should be a third color. Unfortunately, she used up all of the yarn she had purchased for the gifts she made earlier, so she heads to the craft store to buy more yarn. The balls of yarn sold at her local craft store contain 150 yards of yarn. If yarn is only sold in whole balls, how many balls of yarn will she need to complete this project?

*The color that requires 200 yards will require Mary to purchase 2 balls of yarn. The color that requires 800 yards will require Mary to purchase 6 balls of yarn. The color that makes up the remainder requires 1300 – (800 + 200) = 300 yards of yarn, which is 2 balls of yarn. So, for this project, Mary must purchase 2 + 6 + 2 = **10** balls of yarn.*

After completing the projects mentioned in the previous questions, balls of yarn went on sale at the local craft store. This prompted Mary to buy yarn for next year's gifts. Mary bought 18 balls of yarn at the sale. She will make at least one hat, one scarf and one pair of socks from this yarn. If she only uses the 18 balls of yarn purchased at the sale and doesn't want to have any yarn left over, what is the largest number of scarves she can knit?

*If Mary makes exactly 1 hat and 1 pair of socks, that would leave 18 – (1 + 1.5) = 15.5 balls of yarn. Since each scarf uses 3 balls of yarn, she would be left with half of a ball of yarn left over. By making 1 hat and 2 pairs of socks, Mary would have 18 – (1 + 2(1.5)) = 14 balls of yarn for scarves. Since 14 is not divisible by 3, all of the yarn will not be used up in making scarves. Twelve is divisible by 3, so if Mary makes 2 pairs of socks and 3 hats, she will use up the remaining yarn making scarves. Thus, Mary can make a maximum of 12/3 = **4** scarves while making at least one hat and one pair of socks without any yarn left over.*

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